Debt Sustainability and the Terms of Official Support

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Key motivating facts

- Recent debt crises feature euro area governments receiving funding from both the IMF and ESM/EFSF
- The type and terms of official lending differ significantly in maturity and interest rates.
  Euro area institutions lend **more, longer and cheaper**.
- Official loans, especially those from the euro area, smoothened the repayment cash flows and significantly reduced the interest bill of program countries.
- Despite the sharp increase in market interest rates at the onset of the crisis, public debt stocks in program countries kept increasing. Government financed debt accumulation by switching from markets to official financing.
- With improving market conditions, sovereigns returned to bond financing.

Official Lending Terms in the euro area

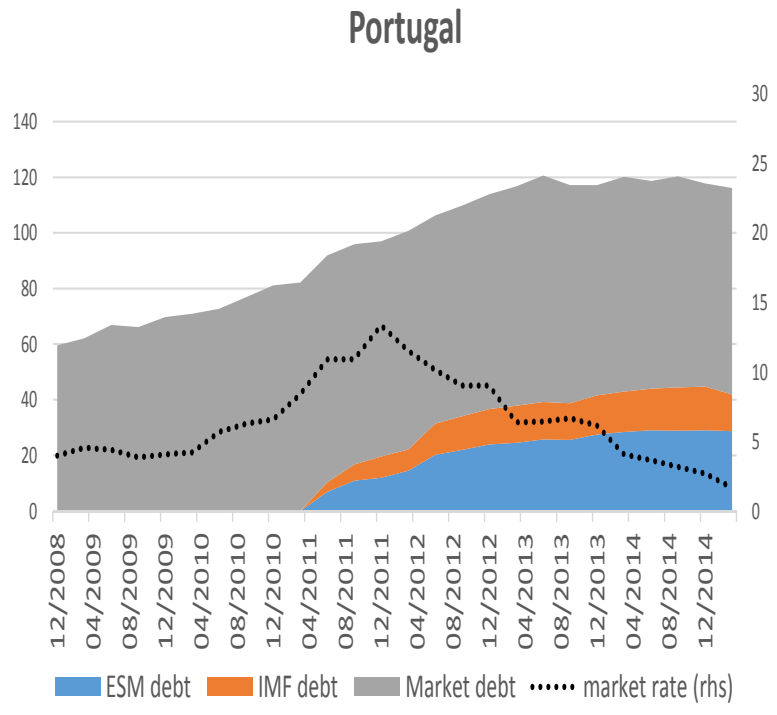
Maturities and marginal lending rate

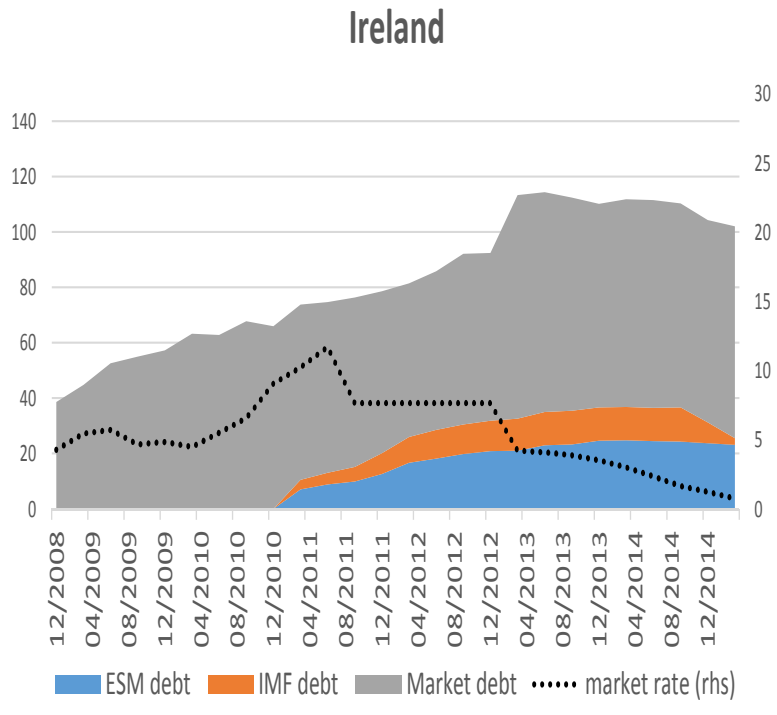
			Dec-10	Dec-11	Dec-12	Dec-13	Dec-14
Ireland	EFSF/ESM	Maturity	7.5 years	15 years	15 years	22 years	22 years
		Interest rate	525 bps	272 bps	255 bps	226 bps	226 bps
	IMF	Maturity	7 years	7 years	7 years	7 years	7 years
		Interest rate	337 bps	321 bps	307 bps	309 bps	404 bps
Portugal	EFSF/ESM	Maturity	-	15 years	15 years	22 years	22 years
		Interest rate	-	277 bps	233 bps	210 bps	210 bps
	IMF	Maturity	-	7 years	7 years	7 years	7 years
		Interest rate	-	321 bps	307 bps	309 bps	404 bps

Sources: International Monetary Fund, European Commission, European Financial Stability Facility, European Stability Mechanism and Bloomberg.

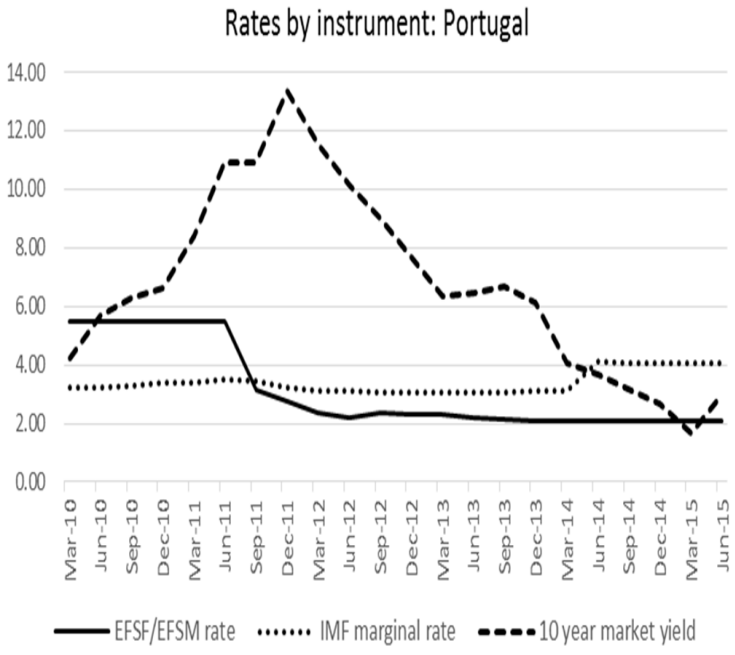
Debt Composition and Market Rates

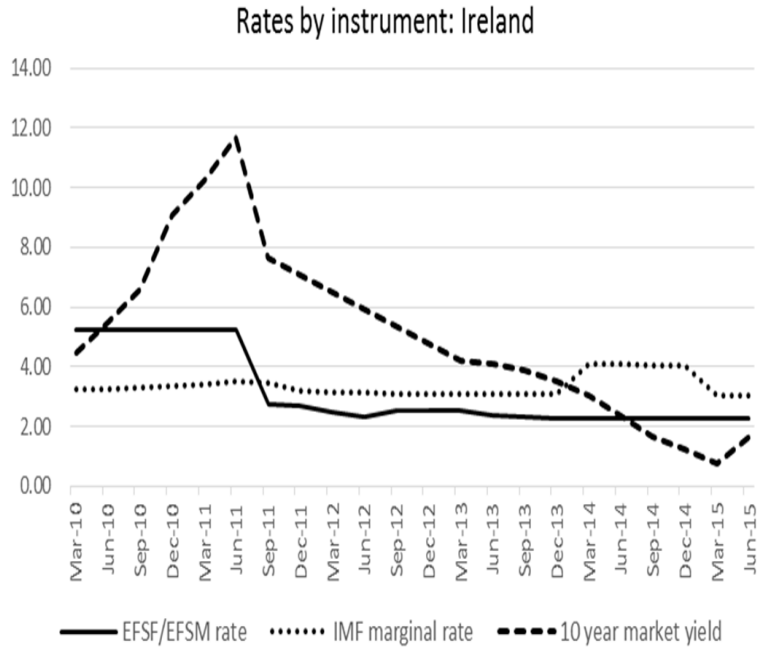
ESM lending includes EFSM loans (for Ireland, also bilateral loans from DK and UK)



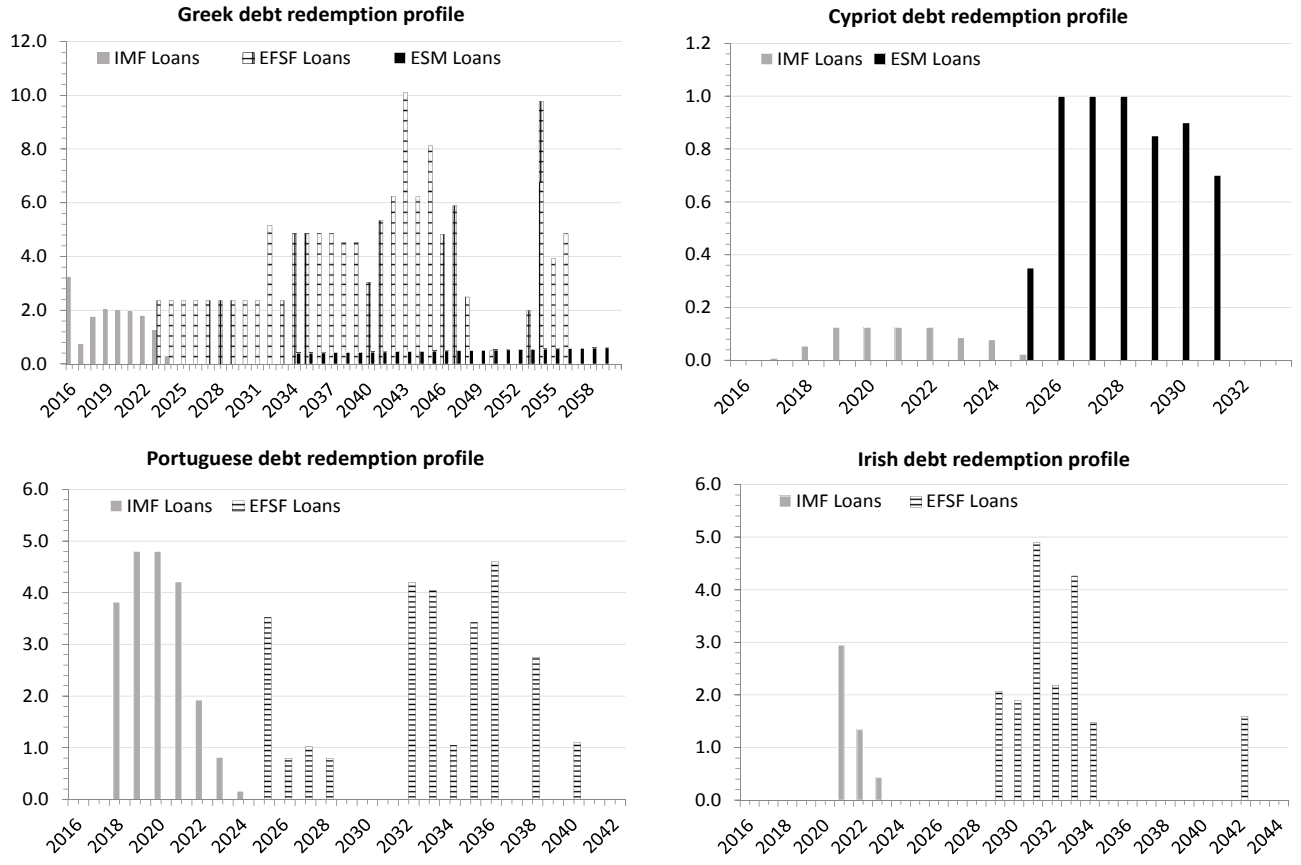


Market and official rates





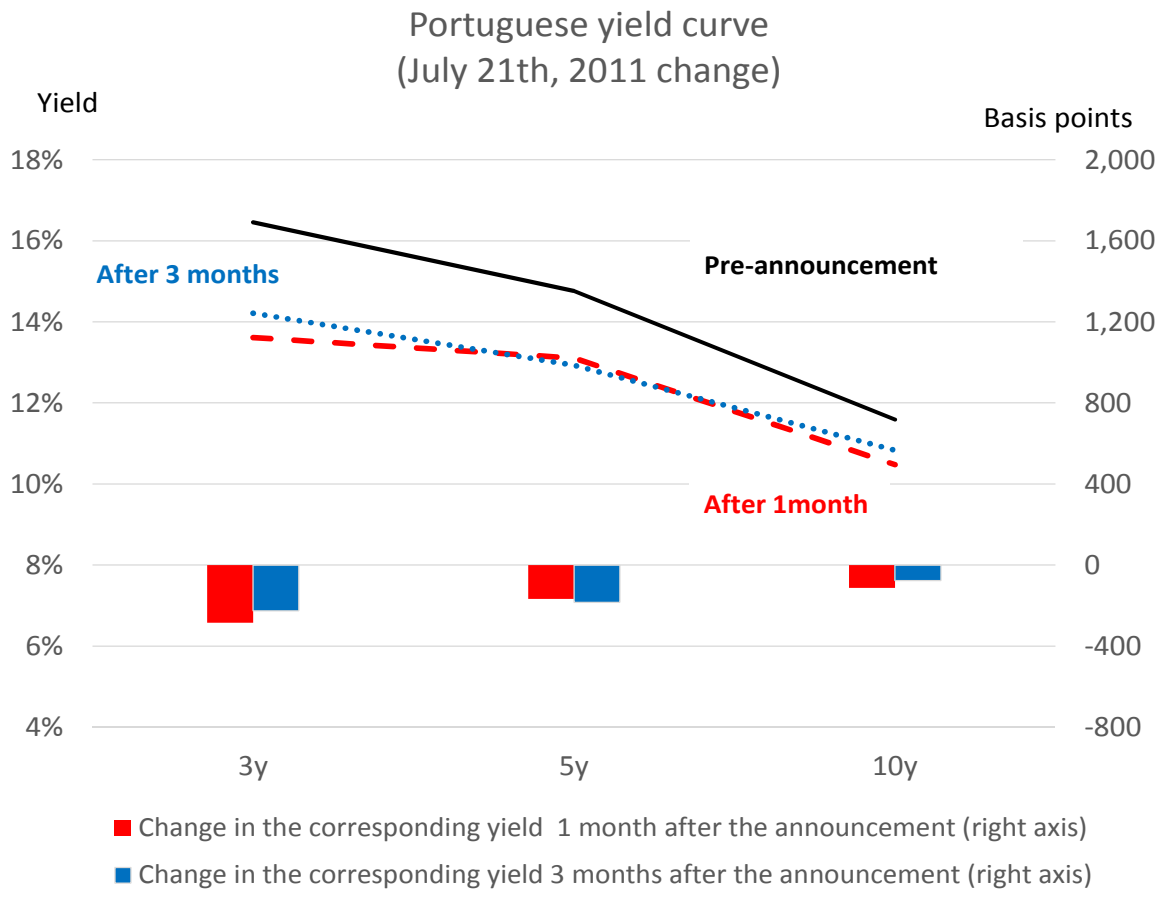
Repayment cash flow



Sources: European Commission, European Stability Mechanism and International Monetary Fund. Debt repyaments measured in billion euros.

Event Study: Changes in the Portuguese Yield Curve

Average of Daily Yields. Data from Bloomberg



The question

- The terms of official loans affect governments' incentives to issue, repay, or default on debt:
  hence they matter for how much debt a country can sustain, just like tax capacity and default costs.

- Debt sustainability cannot be assessed independently of the official lending regime.

- How do size, maturity and price of official loans affect debt sustainability and market access? What are the mechanism and trade-offs?

This Paper

- Introduce official lending in a model of sovereign debt and default after Conesa and Kehoe 2015 (Cole and Kehoe 2000).
- Analyze the effects of Long-Term (LT) vs Short-Term (ST) lending, at different (below-market) rates, on a government's optimal decision to default, in the presence of both fundamental (output) and rollover risk.
- Bring the model to bear on the dynamic of the crisis in Portugal after the country received official support in 2011.

Main findings

- The availability of official loans raises the debt levels at which default is never optimal—it widens the debt "safe region".
- When debt is above the "safe region", official lending helps the government to keep consumption smooth in the face of fundamental shocks and facilitate debt reduction policies.

Potential policy trade-off:

- As a larger "safe region" translates into higher debt—hence lower consumption—in the long run, this reduces the gov't incentive to choose repayment over default.
- In the face of a sequence of fundamental shocks, the country optimally accumulates debt to smooth consumption: the threshold at which default becomes the preferred option **may** become smaller.

Quantitative results

- Model replicates the Portuguese experience in 2011-2015 in a key dimension:
  market rates fall endogenously upon the country accessing official programs, with the composition of debt (official vs market) evolving as in the data.

- In our calibration, the sustainable debt level can be either as low as 80% of GDP, or as high as 180% of GDP, contingent on the state of the economy and depending on the terms of official lending.

- Counterfactual exercises suggest that 'debt tolerance levels' are more sensitive to official loan maturity than spread.

Roadmap for the Rest of the Talk

1. The model
2. Analytical insight
3. Quantitative analysis (Portugal in 2011-2015) and counterfactuals

A Model of Bailouts with Rollover and Output Risk

- In Conesa-Kehoe (2015), debt is in one of three zones

- **Safe zone**: debt is low enough that the country never defaults, not even if loses market access
- **Default zone**: debt is high enough that the country defaults for fundamental reasons, regardless of market access
- **Crisis zone**: for intermediate level of debt, the country repays if market funding is available, but defaults if no funding is available

- Utility is concave (crisis zone disappears with linear utility)

Model

Relative to Conesa and Kehoe (2015), we model bailout agencies. The model features:

- Risk-averse domestic government (and consumers).
  Gov't:
  - taxes output at fixed rate and borrows from the other agents; Minimum non-defaultable spending.
  - is welfare-maximizing and choose whether to repay or default, suffering an exogenously given permanent loss in output.
- Risk-neutral international investors, who lend short at market rate.
- Two official lenders:
  - One (IMF) lends short, the other (ESM) lends long, at below market rates;
    No seniority of official loans (pari passu).

Model

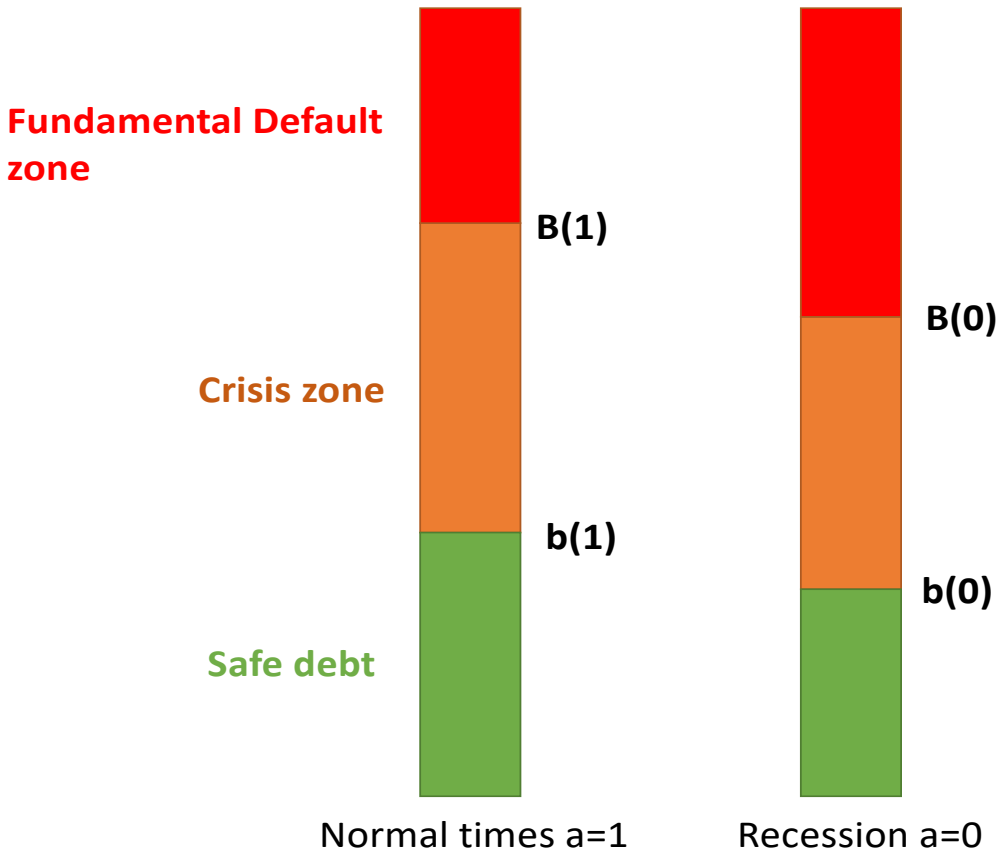
- State vector $s = (b, b_i, b_e, a, z_{-1}, \zeta)$
- Government owes: b to international creditors, b_i to the IMF, b_e to the ESM
- Fundamental risk: economy is in a recession $a = 0$ or in normal times $a = 1$.
  - In a recession, the economy recovers with probability $p < 1$, and once recovered, never falls in a recession again.
- Rollover risk: sunspot drawn from uniform distribution $[0, 1]$:
  - If $\zeta > 1 - \pi$, international creditors expect a crisis to occur and refuse to lend to the government if such a crisis occurs.
- Default has occurred in the past, $z_{-1} = 0$.
  - If the government chooses to default, it stays in default forever.
- Initially (period 0) a shock pushes the economy to a recession.

Debt Thresholds

- The safe, crisis and default zone are defined by **four debt thresholds** above which default occurs:
  - without market financing $b(1)$ and with market financing $B(1)$ in normal times
  - without market financing $b(0)$ and with market financing $B(0)$ in a recession

Debt Thresholds and safe, crisis, default zones

in Normal times and Recessions



Sustainability: Analytical insight

How do the thresholds b(0) B(0) b(1) and B(1) move with official lending?
How does lending affects spending and default decisions in the crisis zone?

- Simplifying assumptions:
  - One official lending instrument, with maturity δ and price q_e
  - Countries lose τ and a units of output when, respectively, in default and recession (in the full model, these are fractions Z and A of output)
  - No minimum consumption spending
  - Initially: outstanding market debt, no official debt

Official Lending Raises the Safe Zone Threshold

Payment ensured even in a rollover crisis

- If market financing stops and there is no official lending ($n\ell$), the maximum sustainable debt ($b_{n\ell}$) solves:

$$u(y - b(1)_{n\ell}) + \beta \frac{u(y)}{1-\beta} = \frac{u(y-\tau)}{1-\beta}$$

(value of repayment = value of default)

- If one-period official funding ($\ell 1$) is available, the above condition becomes:

$$u(y - b(1)_{\ell 1} + qb'_e) + \beta u(y - b'_e) + \beta^2 \frac{u(y)}{1-\beta} = \frac{u(y-\tau)}{1-\beta}$$

Given concavity of u(c), by Jensen's inequality $b_{\ell 1} > b_{nl}$.

- Argument extends to longer loans: $b_{n\ell} < b_{\ell 1} < b_{\ell 2} < \ldots$.

The Government Problem in the Crisis Zone

Rollover risk only

- With no output risk, while in crisis zone, the government decides how to make its way back to the safe zone.
- Optimal trades off between:
  smoother consumption (longer period in crisis) vs.
  a higher price for debt (from being in safe zone earlier).
- Official lending in the crisis zone allow the government to consume more in the transition and may affect the time of exit to the safe zone.

Utility gains from official loans

Rollover risk only

- Official lending with long maturities (or low rates) raises utility in the transition to the safe zone, but reduces it in the long run
- For a given exit time T (making it endogenous does not change the result):

$$\frac{dV^T}{d\delta} = \underbrace{\frac{1-[\beta(1-\pi)]^T}{1-\beta(1-\pi)} u'(g^T) \underbrace{\frac{dg^T}{d\delta}}_{<0} +}_{\uparrow V^T \text{ as } \downarrow \delta}$$

$$\underbrace{+[\beta(1-\pi)]^{T-2} \frac{\beta u'(y-[1-\beta]b_l(1))}{1-\beta} \cdot -(1-\beta) \underbrace{\frac{db_l(1)}{d\delta}}_{<0}}_{\downarrow V^T \text{ as } \downarrow \delta}$$

Trade-off in official lending

Rollover and output risk

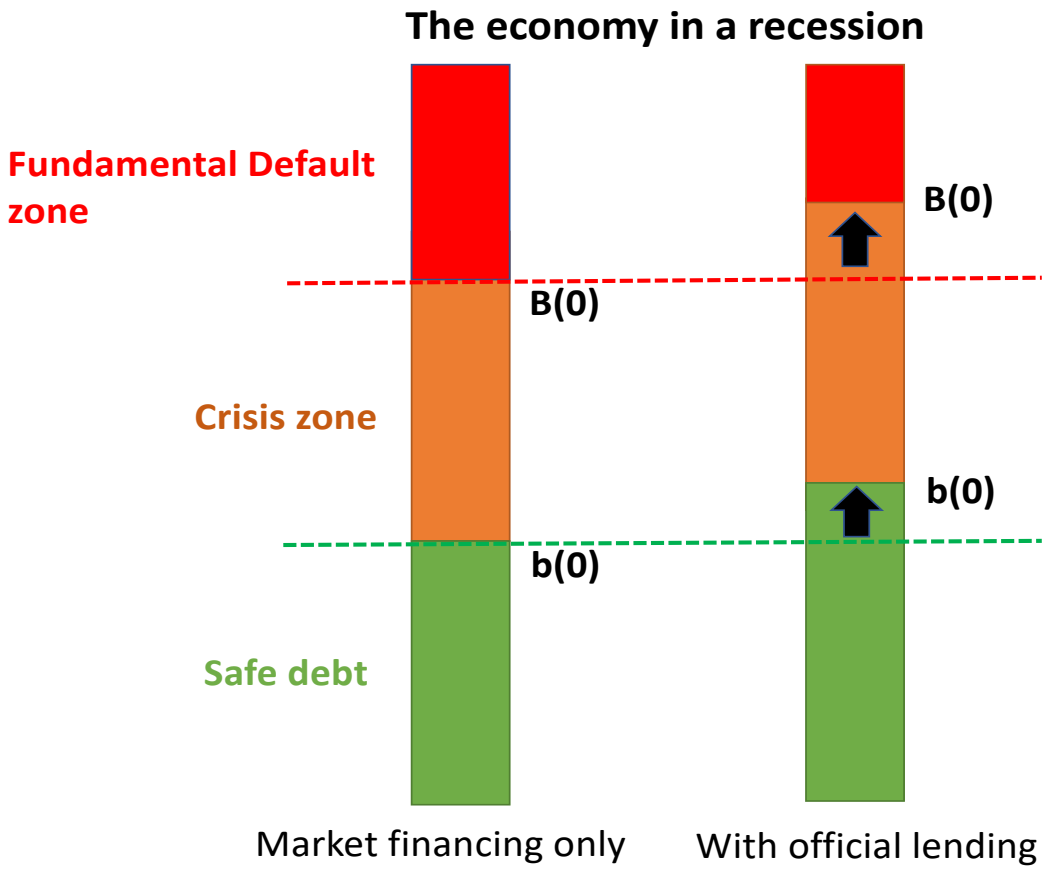
- Key: once debt is in the safe zone, there is no welfare incentive for the government to deleverage further. Consumption in the long run is lower.
- Everything else equal, a high long-run debt reduces the value of repayment. This **may** reduce the upper threshold at which the country defaults for fundamental reasons.

With output risk:

- Utility from official lending is higher: government has larger 'fiscal space' to smooth recessions.
- As debt accumulates in bad times, however, default **may** become the preferred option at *lower level* of debt than in the absence of official lending.

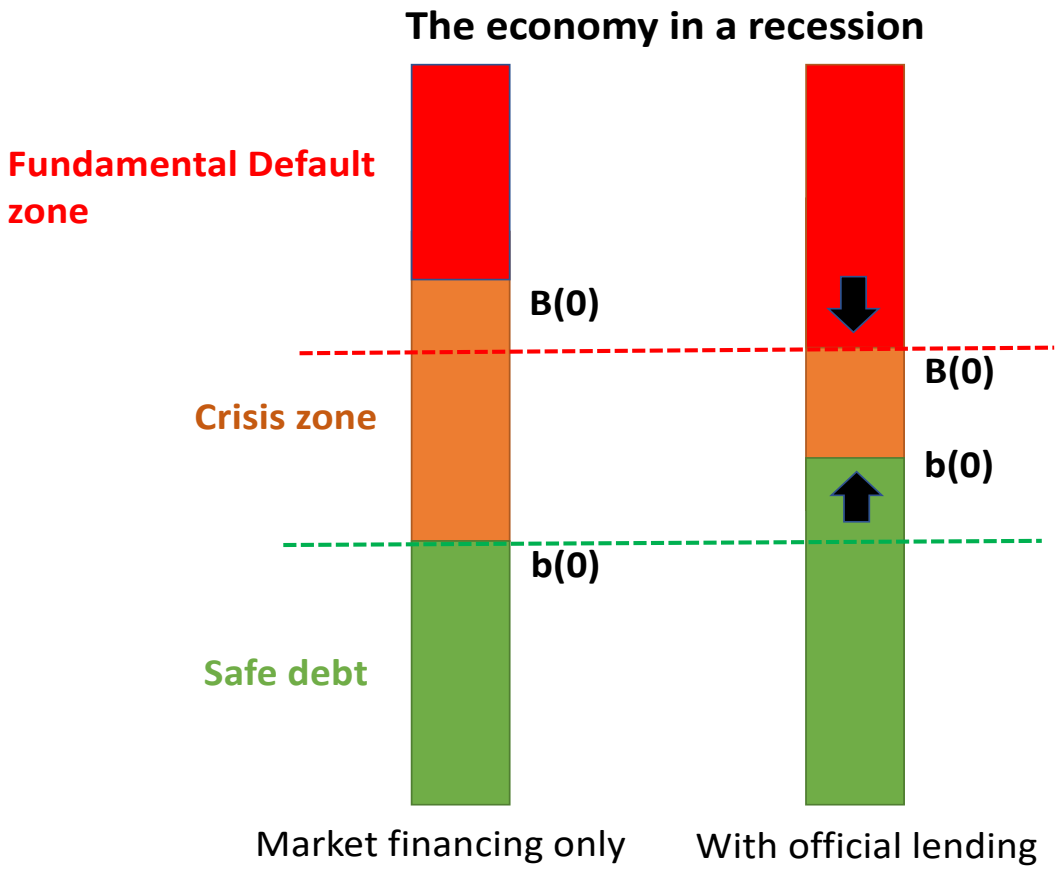
Effects of official lending on the safe, crisis, default zone

Case of improved resilience to fundamental default



Effects of official lending on the safe, crisis, default zone

Case of higher vulnerability to fundamental default



Quantitative Analysis

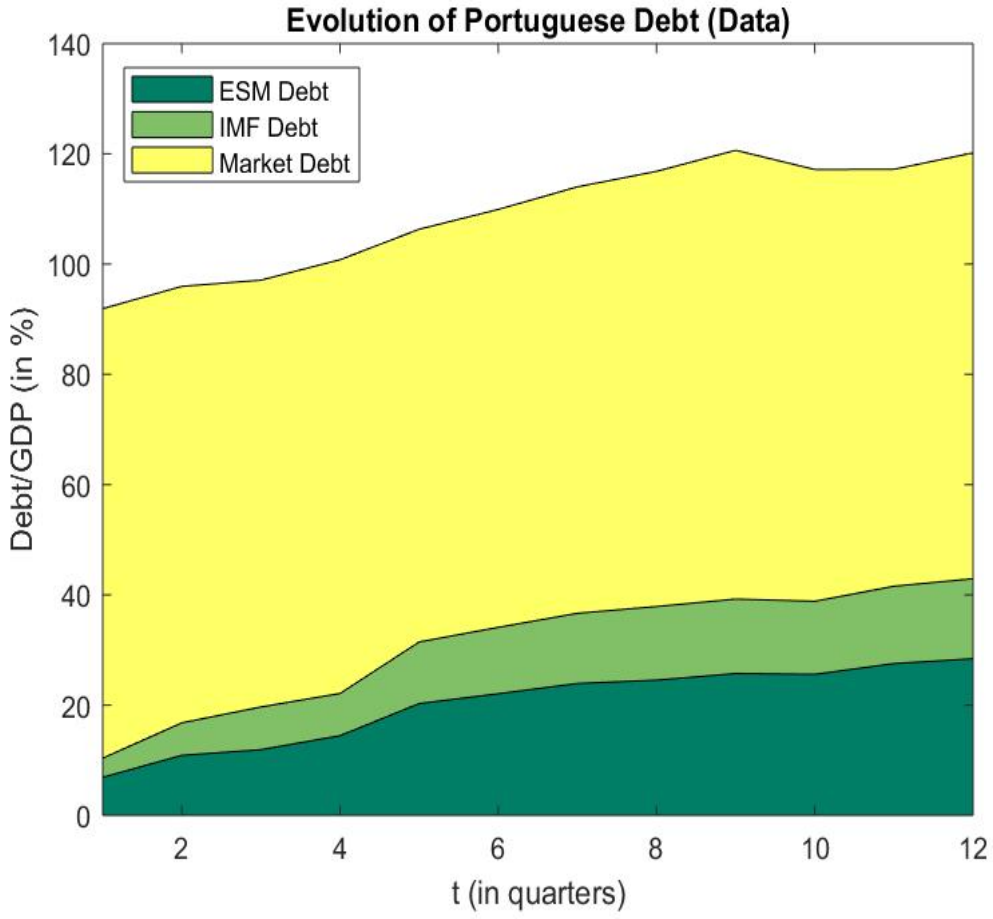
Benchmark

- Using the actual terms of loans by the IMF and euro-area institutions, the model does a good job in matching the evolution of debt, debt composition and market rates in the data.

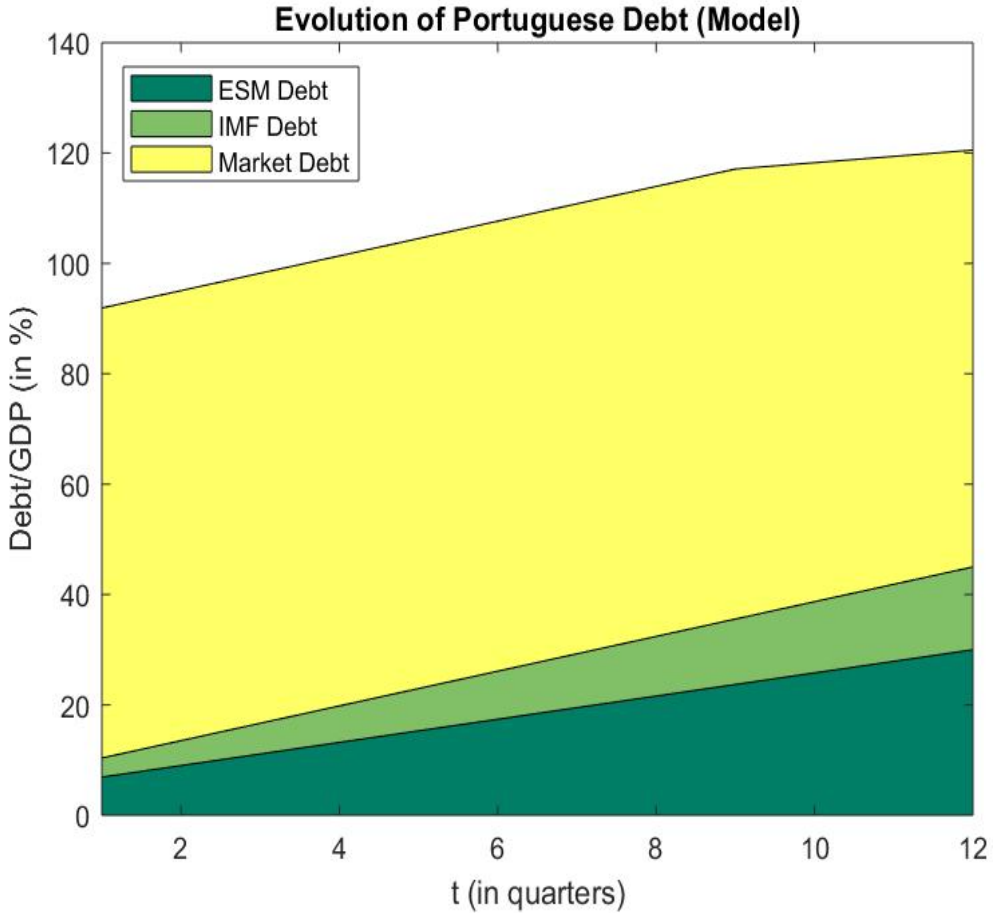
Quantitative Analysis: Calibration

Y	Output	100
Z_d	Default cost	0.95
A	Fraction of output during recession	0.93
β	Discount factor	0.98
π	Probability of a run in the crisis zone	.07
θ	Goverment revenue as a share of output	0.4
$\overline{g}$	Level of essential government expenditure	25
γ	Relative weight of c and g in the utility function	0.5
p	Probability of leaving the recession	0.33
δ	Amortization of market borrowing (6 years)	0.1667
δ_i	Amortization of IMF loan (7 years)	0.1429
q_i	Price of IMF loans	0.9483
δ_e	Amortization of ESM loan (15 years)	0.067
q_e	Price of ESM loans	0.9662

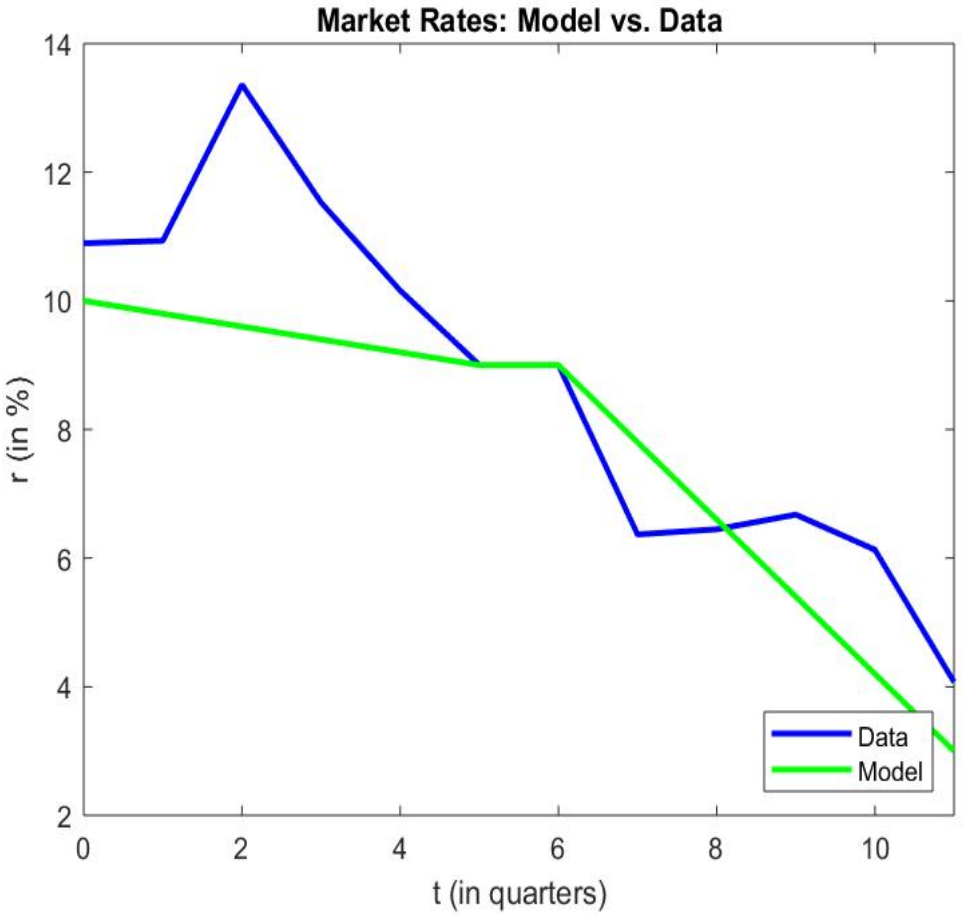
Evolution of Portuguese Debt: Data



Evolution of Portuguese Debt: Model



Market rates: data and model



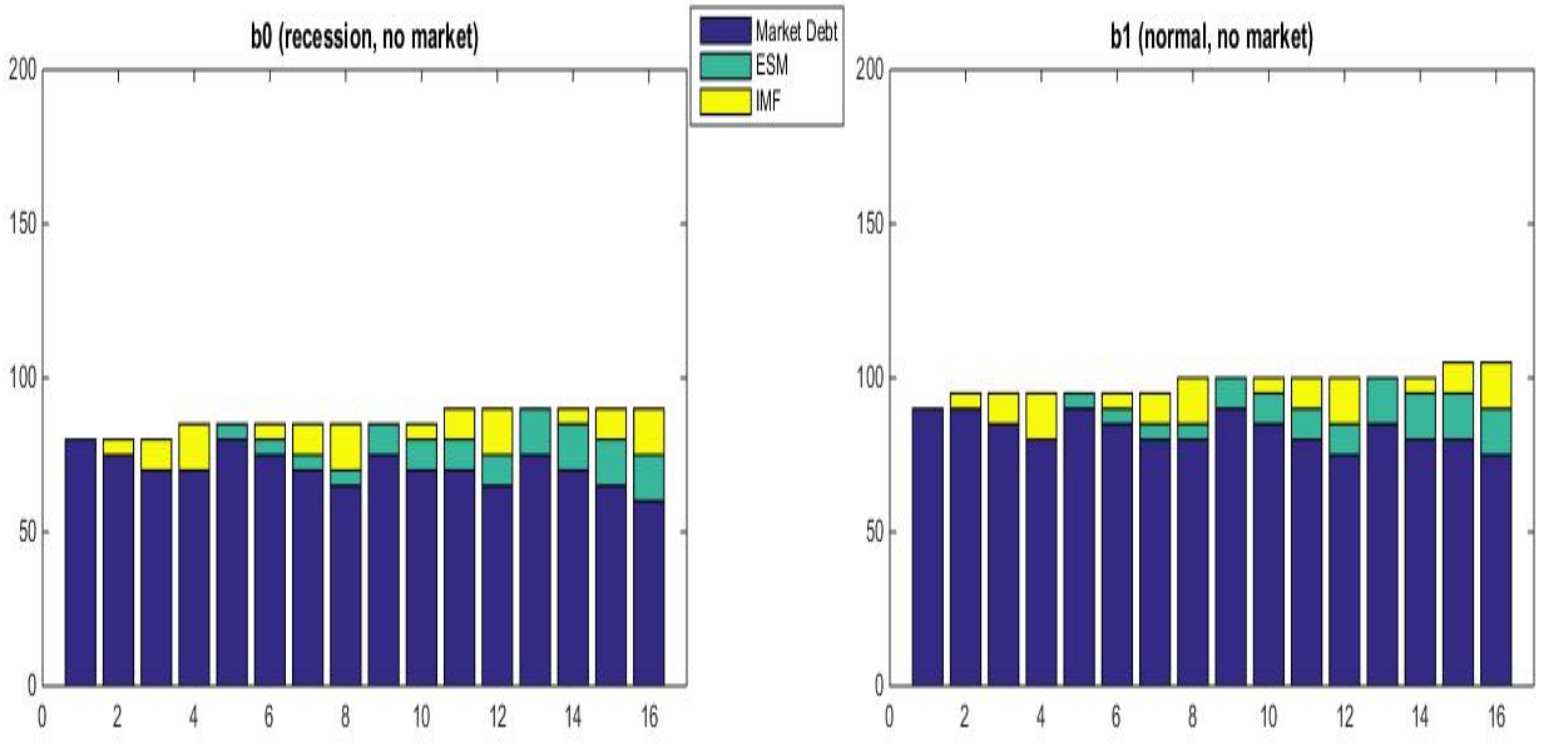
Mapping Analytic to Quantitative Results

Debt Thresholds Varying Official Support Size and Composition

- We now plot the four thresholds in 4 graphs, each with 16 combinations of market and official loans.
  - We let IMF and euro-area loans rise in steps of 5% of GDP.
- Panels (1 and 2): **safe zone limits $b(0)$ and $b(1)$ increase unambiguously** as theory predicts.
- Panels (3 and 4): **the crisis zone limits $B(0)$ and $B(1)$ increase for official loans up to 10% of GDP, but decrease if support is larger**: the tradeoff inherent in official lending kicks in!

Debt Thresholds Varying Official Loans Size and Composition

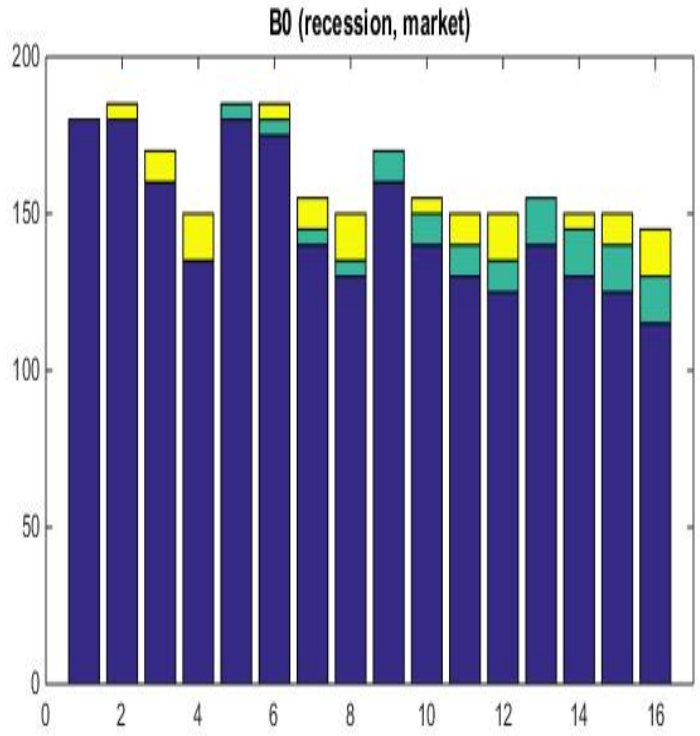
Safe debt in recessions and normal times, benchmark calibration

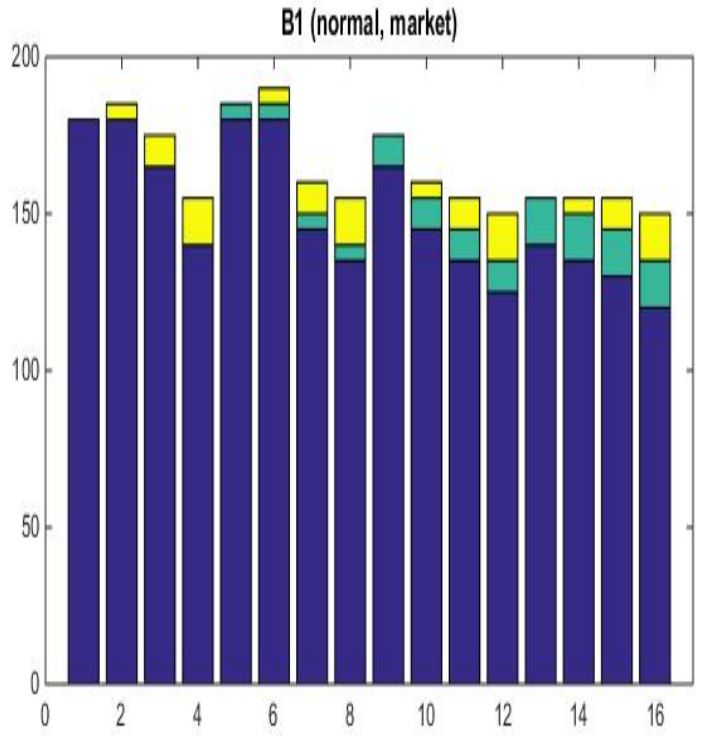


Each bar is total sustainable safe debt (% of GDP), varying its composition by creditors: **ESM (euro-area) lending is Green**, **IMF lending is yellow**, **market lending is blue.**

Debt Thresholds Varying Official Support Size and Composition

Sustainable risky debt in recessions and normal times, benchmark calibration





Each bar is total sustainable risky debt (% of GDP), varying its composition by creditors: **ESM (euro-area) lending is Green**, **IMF lending is yellow**, **market lending is blue.**

Conclusions

- The terms of official loans affect governments' incentives to issue, repay, or default on debt:
  hence they matter for how much debt a country can sustain, just like tax capacity and default costs.

- We augment a model of optimal default to gain insight on the mechanism. Long maturities and low spreads:
  - reduce the exposure to rollover risk, facilitating consumption smoothing and deleveraging of debt;
  - enhance sustainability against any given credible repayment flows—contribution to the creation of "safe asset" in the EA;
  - raise the average stock of debt in the economy, which may/may not reduce resilience to negative fundamental developments.

Sustainable debt

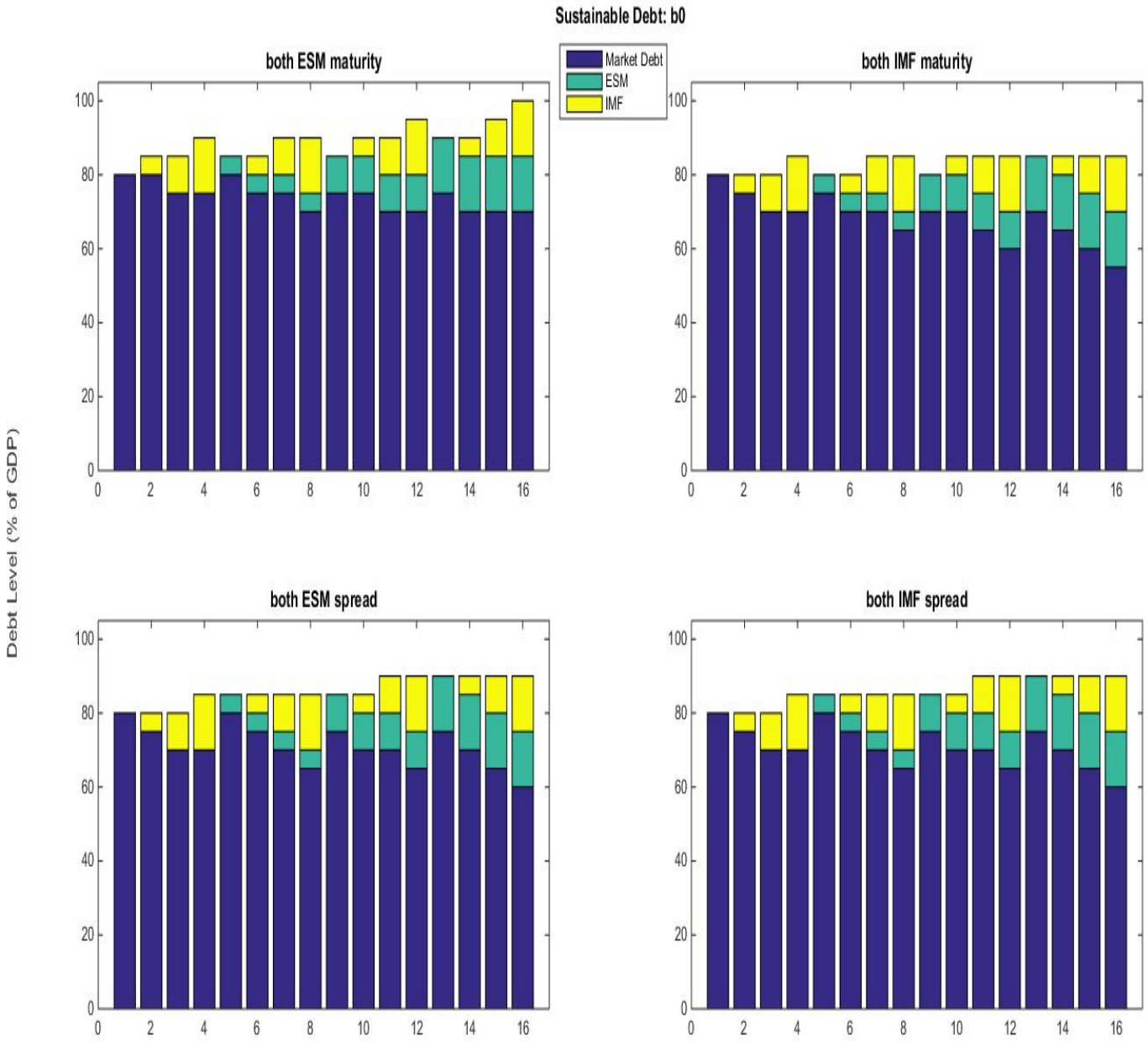
- Our quantitative model can explain cases like Portugal in 2011-2015, whereas rates on gov't bonds fell even if debt as a fraction of GDP rose.

- In our exercises, sustainable debt ranges from low (80% GDP) to very high (180% GDP) levels, depending on (i) the state of the economy (output and market access) and (ii) availability and the size of official loans, spreads and maturities (debt composition)

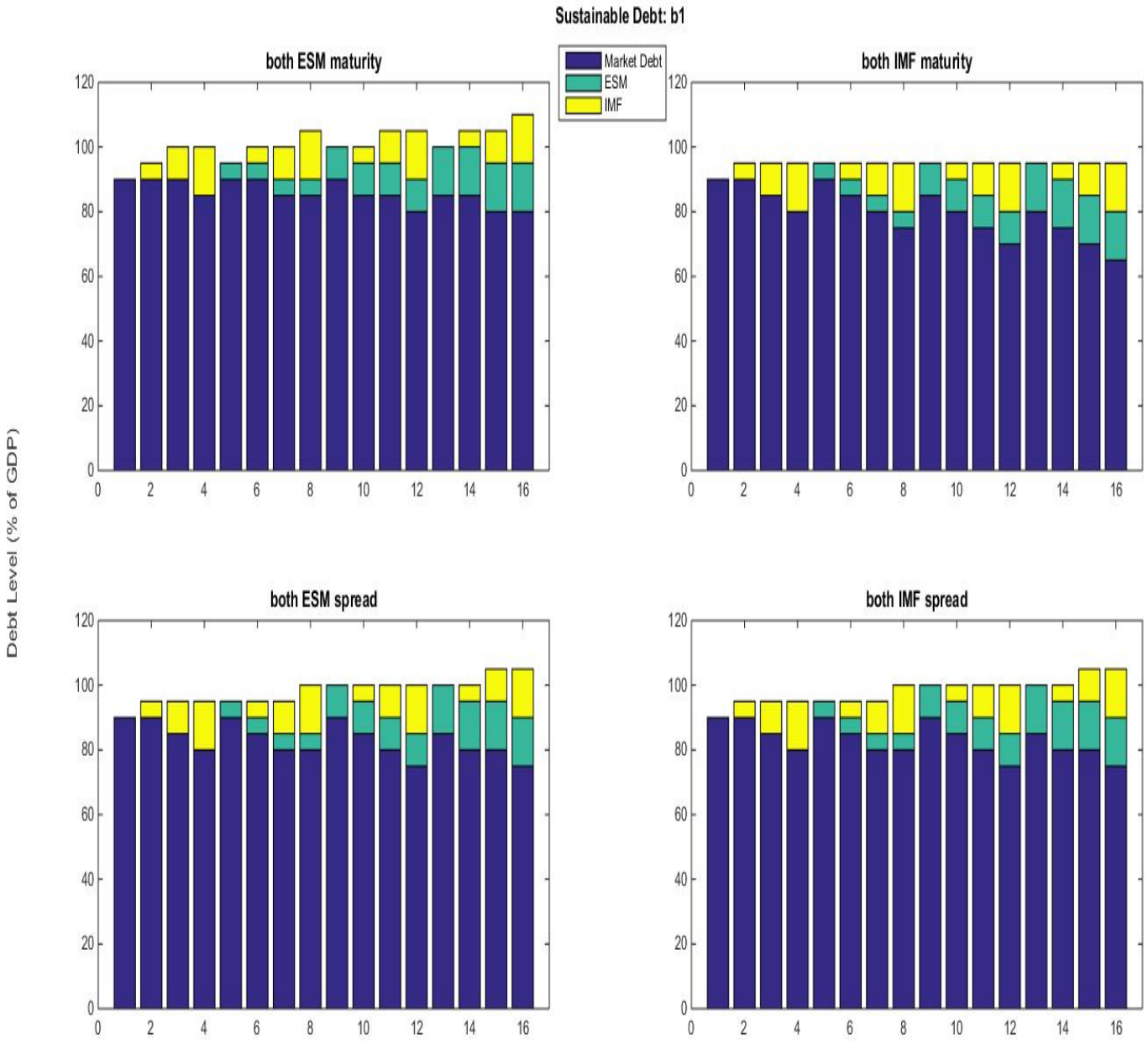
- The analysis lends support to revisions of Debt Sustainability Analysis and Programme design incorporating a "debt management" perspective.

    - By accounting for repayment flows and their effect on market access and fiscal policies in the analysis, official lenders could enhance their ability to design effective operations.

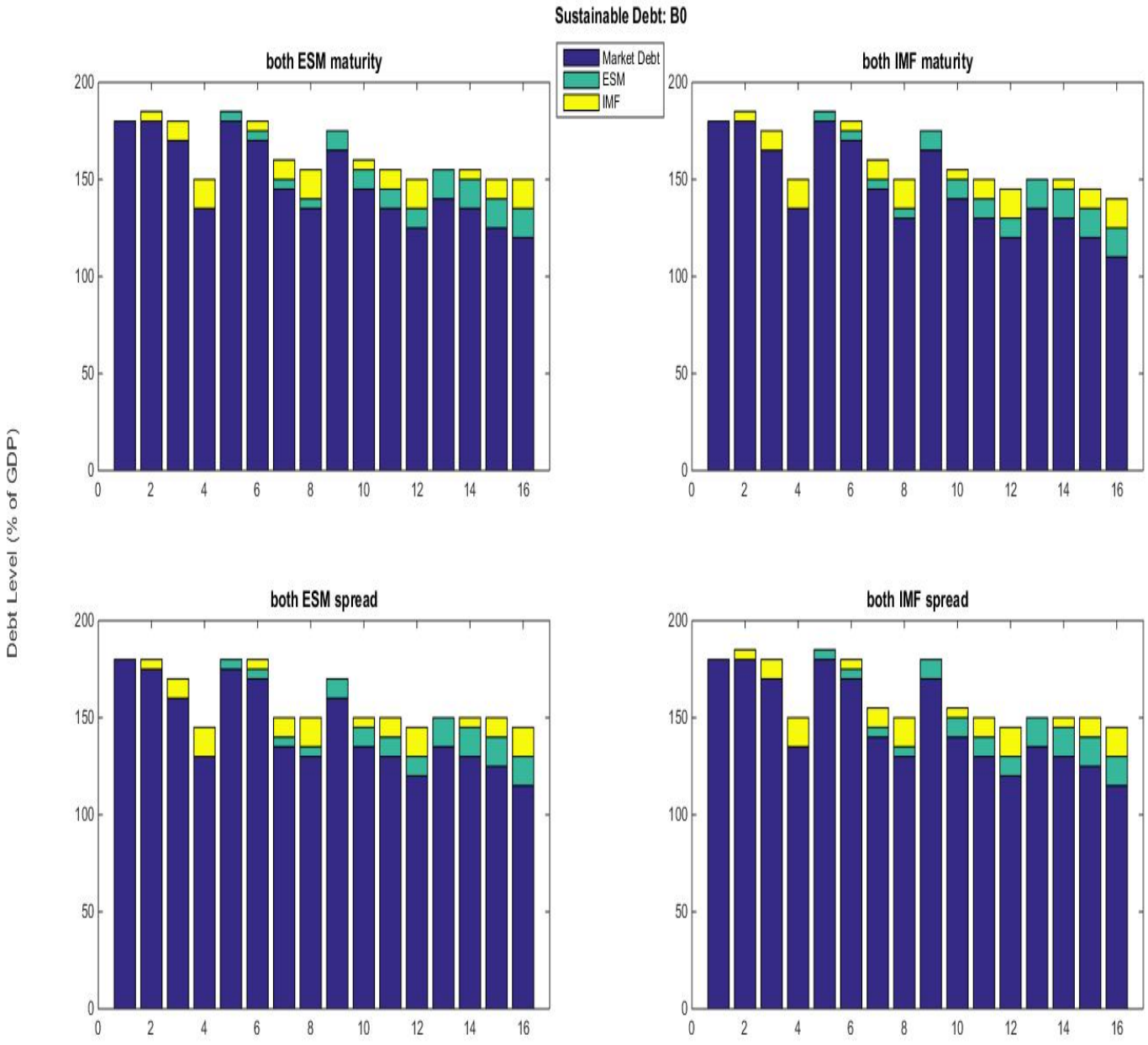
Counterfactuals on b(0): Different Spreads and Maturity



Counterfactuals on b(1): Different Spreads and Maturity



Counterfactuals on B(0): Different Spreads and Maturity



Counterfactuals on B(1): Different Spreads and Maturity